

**Department of Electronics & Communication Engineering
National Institute of Technology, Srinagar**



Outline of the Syllabus for the Admission Test of M. Tech.
(Communication and Information Technology)

Basic Electric Engineering and Network Analysis

Electric circuit laws

Basic Electric circuit terminology, Ohm's law, Kirchoff's current law (KCL) and Kirchoff's voltage law (KVL), Circuit parameters (Resistance, Inductance and capacitance), Series and Parallel combinations of resistance, Inductance, and capacitances

DC circuit analysis

Power and energy relations, Analysis of series parallel dc circuits, Delta star Transformation, Loop and Nodal methods, Thevenin's Theorem, Maximum Power Transfer Theorem, Superposition theorem

AC circuit analysis

Basic terminology and definitions, Phasor and complex number representation, solutions of sinusoidal excited, RC, RL, RLC circuits, Power and Energy relations in ac circuits. Applications of network theorems to ac circuits, Resonance in series and parallel circuits

Magnetically couples circuits

Mutual inductance, Theory of magnetic circuits and electromagnetism, Transformers

Wave form analysis and synthesis

The unit step, ramp and impulse functions and Laplace transforms, Initial and final value of $f(t)$ from $F(s)$, Convolution integral, convolution as summation, Fourier Series and Signal spectra

Network theorems and Impedance functions

Complex frequency, transform impedance and transform circuits, series and parallel combination of elements

Network functions – Poles and Zeros

Ports or terminal pairs. Network and functions for one port and two port networks (ladder and general networks), Poles and Zeros of network functions, Restriction on Pole and Zero locations for driving point and transfer functions, Time domain behavior from pole-zero plot

Two port parameters

Relationship of two parameters, Admittance, Impedance, Transmission, and Hybrid parameters, Relationship between parameter sets, Parallel connection of two port networks

Electronic Devices, Circuits, and Design

Introduction to semiconductors

Intrinsic and extrinsic semiconductors, Band diagram, Conductivity, Transport and Recombination mechanism of charge carriers, Electric properties, Hall effect etc.

PN junction diode

Current components in p-n junction, characteristic piece wise linear approximation, temperature dependence, Diode capacitance, and switching times, Diode circuits: half wave, full wave rectifiers, clipping circuits etc. Basic operation of Zenor, Avalanche, Schottky Photo, Varacter, and Tunnel diodes

Bipolar Junction Transistor

Types, operation, and characteristics, Ebers – Moll model, CE, CB and CC configuration. Input, Output characteristics and graphical analysis of basic amplifier circuits, Biasing and Bias stability, Low frequency h – parameter model, Analysis and Design of transistor amplifier circuits using h parameters. High frequency hybrid – pi model, analysis and design of transistor amplifier circuits at high frequencies. Multistage amplifiers, photo- transistors, Transistors as a switch, Semiconductor controlled rectifier.

Field Effect Transistor

JFET: Operation and characteristics, model, application at low and high frequency, amplifiers, switching circuits, MOSFEET: Types, Operation and characteristics, MOSFET as a basic digital building block.

Feedback Basic

Negative feed back, Positive feed back, Effect of negative feedback on the performance of amplifiers, Types of feedback amplifiers, current shunt, current series, voltage shunt, and voltage series feedback. Analysis of feedback amplifiers circuits, Gain Bandwidth compensation techniques

Sinusoidal Oscillators

Basic operations, analysis of general oscillator circuit, Barkhausen's criteria, Various types of oscillator circuits and their analysis, Design of practical oscillator circuits

Power Amplifiers and Power Supplies

Classification of power amplifiers, Class A, Class B, Class AB and Class C power amplifiers, Analysis and Design of power supplies and IC regulators

Operational Amplifiers

Operational amplifier stages, differential amplifier, CMRR, Cascade amplifier, Ideal and practical operational amplifier characteristics and properties, OP amp applications, inverting

and non inverting amplifiers, difference amplifier, summer differentiator, integrator and rectifiers etc. OP AMP in analog computation and other applications

RF Tuned Amplifiers

Principal and Operation, Resonance frequency, Analysis and Design, Impedance matching

Linear Wave Shaping Circuits

RC and RLC Circuits and their response to various wave forms

Multivibrators and Wave Form Generators

Bistable, Monostable and astable multivibrator circuits, and their analysis. Wave form generators, triangular and square wave generators

Digital Electronics, Microprocessor and Computer Hardware

Digital and Logic Design

Binary, Octal and Hexadecimal number systems, Various types of codes, Boolean algebra and Boolean theorems

Logic gates and implementation of Boolean functions with various types of logic gates. Circuit equivalence

Simplification techniques and minimization by map methods, and Tabular method

Combination logic and arithmetic circuits, Encoders and Decoders, Multiplexers and Demultiplexers

Sequential circuits – state diagrams and state tables, design and analysis of flip flops, registers, counters, Synchronous and Asynchronous operation of sequential circuits

Analog to Digital converter, Digital to Analog Converter

Microprocessor

Architecture of 8085 microprocessor

Instruction and timings, Introduction to 8085 basic instructions, Programming techniques with additional advanced instructions, Counter and timing delays, Stack and Subroutines, Software development System and Assemblers, Interfacing peripherals (I/O's) and applications, Parallel input/output and interfacing applications, Interrupts, Interfacing data converters, SDK 85 programmable interfaces, General purpose programmable peripheral devices, Serial I/O and data communication

16 Bit processors, Introduction to 8086/8088

Introduction to Micro controllers

Computer Hardware

Introduction to Computer architecture and organization, Computer Organization and Instruction cycle control, CPU Organization, I/O devices and Organization

Latches and memory organization, Types of memories: ROM EPROM and RAM, Static, Dynamic and Flash, Introduction to PLA

Comparison of CISC and RISC architecture

Communication Systems and Theory

Spectral Analysis of Signals

Fourier series of repetitive signals, Fourier transform of non repetitive signals, Amplitude Spectrum of special signals viz., pulse train and pulse wave form

Modulation and Demodulation

DSB with carrier, DSBSC, SSB, VSB, Angle modulation, NBFM, WBFM, Diode detector, Frequency discrimination, AM and FM receivers

Noise Analysis

Signal to Noise ratio, Noise Figure, Performance of AM and FM Systems, in presence of noise Threshold in AM and FM Demodulation, Pre emphasis, De emphasis in FM Systems

Digital Communication

Sampling, Quantization, Quantization Noise, Coding, Pulse code Modulation, Differential PCM, ADPCM, Relative advantages and dis-advantages, Delta modulation, PWM and PPM

Digital Modulation Techniques

ASK, FSK, PSK, M-FSK, DPSK, QAM Schemes

Data Communication

Data Transmission, data encoding, digital data communication technique, protocol, interface standard

Error detecting and error correcting technique, nature of transmission errors, error detecting codes, error correcting codes, Retransmission techniques

Multiplexing and De multiplexing techniques viz., TDM, FDM

Introduction to transmission media and network topologies, MAN, LAN, WAN

Synchronous and Asynchronous networks, carrier, bit, and frame synchronization

Circuit Switching, message switching and packet switching, relative advantages and disadvantages

Routing techniques, flooding, static routing, centralized routing, distributed routing

Multiple access scheme viz., TDMA, FDMA, ALOHA, CSMA Techniques

Integrated services, Digital Network, Broadband ISDN

Transmission Line

The Transmission line general solution, Basic definition, Distortion less line, telephone cables, inductance loading, line not terminated in Z_0 , Open and Short circuited lines, Reflection and Transmission coefficient, Reflector factor and reflection loss, parameters of open wire and coaxial lines at radio frequency constants of dissipation less line, standing wave ratio (SWR), Input Impedance of loss-less, open wire and short circuited Co-axial lines at radio frequency, Quarter wave lines as impedance transformer, Half wave and eight wave lines, Impedance matching, Smith chart and its applications

Antenna

Basic Antenna parameters, elementary doublet, Half wave antenna, Vertical antenna above ground, Grounded quarter wave antenna, Directivity and Antenna Gain, Bandwidth and

Beamwidth, Radiation Pattern's, Folded dipole and applications, Antenna arrays, Parabolic reflector, properties and feed mechanism, Horn Antenna, Loop Antenna

Propagation of Waves:

Waves in free space, Attenuation, Absorption and Polarization, Effects of environment, ground on wave propagation, Sky wave propagation, Space wave propagation, Trosposcatter propagation and Extra terrestrial propagation

Satellite Communication

Principle, Operation, Applications

Computer Software

Programming and C language

Problem solving, Algorithms, Techniques in problems solving, Flow charting, step wise refinement, Modularity of programmes

Introduction to C language, Various data types of C, Decision making, Structure arrays and Pointers. Functions, Procedures, File management etc

Introduction to C++

Data Structure

Definition and operation on Array's Stacks, Queues, Lists, Trees, Evaluation of arithmetic expressions, using stacks, recursion and recursive algorithms, List representation, Recursive and non recursive definition of tree structures, Binary trees, Operations using recursive and non recursive algorithms, Forests, Simple Searching and Sorting algorithms, Hashing Techniques

Operating Systems

Introduction to DOS, Windows, and Linux, Their comparison

Data Base Management

Different DBM systems, Applications

Internet

Introduction

(Coordinator)
M Tech (2011)
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